23
6.4 # 33

6.5 #31
22

6.2 #57

6.2 #57

$$\int_0^1 \frac{10\sqrt{\theta}}{(1+\theta^{3/2})^2}\,d\theta \qquad u = 1+\theta^{3/2} \qquad du = \frac{3}{2}\sqrt{\theta}\,d\theta$$

$$\frac{2}{3}du = \sqrt{\theta}\,d\theta$$

$$10\cdot\frac{2}{3}\int_0^1 \frac{du}{u^2} \Rightarrow F(x) = -\frac{1}{u} + c \Rightarrow -\frac{20}{3(1+\theta^{3/2})} + c$$

$$u^{-2}$$

$$-\frac{20}{3(1+1)} - -\frac{20}{3(1)} =$$

$$-\frac{20}{6} + \frac{40}{6} = \frac{20}{6} = \boxed{\frac{10}{3}}$$

$\boxed{6.4 \ \#23}$

$$y = \underbrace{A}_{\text{initial}} \, \underbrace{b}_{\text{base}}{}^{x}$$

$$y = 1 \cdot 2^{48} \Rightarrow 2.8 \times 10^{14} \text{ bacteria}$$

6.4 #33

(a) use calc. ⇒ stat, edit, enter data
then, stat, calc, exp.reg

$(T - T_s) = 79.466(0.932)^x$

(b) $T = 10 + 79.466(0.932)^x$

(c) $12 = 10 + 79.466(0.932)^x$
$-10 \quad -10$

$\dfrac{2}{79.466} = \dfrac{79.466(0.932)^x}{79.466}$

$\dfrac{2}{79.466} = 0.932^x \qquad x = \dfrac{\ln\left(\frac{2}{79.466}\right)}{\ln(0.932)} \approx 52.3 \text{ sec.}$

(d) $T_0 = 89.466°C$

6.5 #22

$$\int \frac{2x^3}{x^2-1}\,dx$$

$$x^2+0x-1 \overline{\big) 2x^3+0x^2+0x+0}$$ with quotient $2x + \frac{2x}{x^2-1}$

$$-2x^3 \mp 0x^2 - 2x$$

$$2x + 0$$

$$\int 2x\,dx + \int \frac{2x}{x^2-1}\,dx \qquad u = x^2-1 \quad du = 2x\,dx$$

$$x^2 + \int \frac{1}{u}\,du \Rightarrow \boxed{x^2 + \ln|x^2-1| + C}$$

$\boxed{6.5\ \#31}$

$$P(t) = \frac{1000}{1+e^{4.8-0.7t}}$$

$$P(t) = \frac{M}{1+Ae^{-Mkt}}$$

$$= \frac{1000}{1+\underbrace{e^{4.8}\cdot e^{-0.7t}}_{A\cdot e^{-0.7t}}}$$

$$-0.7t = -Mkt$$

$$-0.7t = -1000kt$$

$$K = 0.0007$$

$$M = 1000$$

$$P(0) = \frac{1000}{1+e^{4.8}\cdot 1} \approx 8$$

Equations you need

- 25 derivative rules (esp. trig ones)
- Investments $A(t) = P\left(1 + \frac{r}{c}\right)^{ct}$

$A(t)$ = Amount as function of time

P = Principle (initial amount)

- Investment continuous $A(t) = Pe^{rt}$

r = % APR as a decimal

c = compounding periods

t = time years

- Newton's law of cooling

$$T - T_s = (T_0 - T_s)e^{-kt}$$

T = temp of item

T_s = temp of surrounding

T_0 = initial temp

$-k$ = constant

t = time